

## SECTION [26 11 13][16360]

### MEDIUM VOLTAGE UNIT SUBSTATIONS

#### Square D Medium Voltage Unit Substations by Schneider Electric

Schneider Electric Editor's Note:

This guide specification is written in accordance with the Construction Specifications Institute (CSI) Master Format. This section must be carefully reviewed and edited by the architect or the engineer to meet the requirements of the project. Coordinate this section with other specification sections within the Contract Documents and Drawings.

To properly use / edit this document, show formatting and hidden text by selecting ¶ on the menu or by typing (Ctrl+\*) simultaneously. Except for these introductory and closing paragraphs, green hidden text will not print. Text in red is optional. Red text in [brackets] denotes multiple options where one or more should be chosen. All red text should be edited and changed to black for final project conformation. In addition, these introductory paragraphs should be deleted or changed to hidden text. Additional guidance and specifications can be found at <https://www.schneider-electric.us/e2e>.

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Scope: Provide labor, material, equipment, related services, and supervision required, including, but not limited to, manufacturing, fabrication, erection, and installation for Medium Voltage Unit Substations (also identified as primary unit substations, secondary unit substations, MV USS or USS) as required for the complete performance of the work, and as shown on the Drawings and as herein specified.
- B. MV Unit substations shall consist of a primary MV (>1000 V) incoming section, a MV substation transformer and a secondary outgoing section to distribute power. Primary unit substations shall transform MV to a lower MV for distribution and secondary unit substations shall transform MV to LV (≤1000 V) and for distribution.
- C. Related Sections: Related sections include, but shall not be limited to, the following:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
  - 2. Applicable general requirements for electrical Work specified within Division 26 Specification Sections apply to this Section.
  - 3. The following information is typically depicted on the Drawings: bus configuration, bus ratings, [interrupting ratings,] circuit breaker ratings, main and feeder connections, application specific control wiring, elevation and footprint, etc. Where not shown on or able to be derived from the Drawings, the minimum requirements specified herein shall be provided.
  - 4. Refer to the following specification sections(s) for additional unit substation MV primary or MV secondary section requirements:
    - a. Section 26 13 16 Medium Voltage Fusible Interrupter Switchgear
    - b. Section 26 13 26 Medium Voltage Metal-Clad Switchgear
    - c. Section 26 13 29.13 Medium Voltage Compartmentalized Fusible Switchgear
    - d. Section 26 13 29.16 – Medium Voltage Compartmentalized Circuit Breaker Switchgear
    - e. Section 26 18 39.13 – Medium Voltage Motor Controllers
  - 5. Refer to specification [Section 26 12 13 Medium Voltage Liquid Filled Substation Transformers] [Section 26 12 16.11 Medium Voltage Dry Type Cast Coil Transformers] [Section 26 12 16.13 Medium Voltage Dry Type VPI Transformers] for additional substation transformer requirements.
  - 6. Refer to the following specification section(s) for additional unit substation LV secondary section requirements:
    - a. Section 26 23 00 Low Voltage Switchgear

- b. Section 26 24 13.11 Switchboards
- c. Section 26 24 19 Motor Control Centers
- 7. Refer to specification Section 13 34 23.11 Fabricated Electrical Houses for additional requirements
- 8. Refer to specification Section 26 09 13 Electrical Power Management Systems for additional requirements

## 1.2 REFERENCES

- A. General, Publications: The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only. The edition/revision of the referenced publications shall be the latest date as of the date of the Contract Documents, unless otherwise specified.

In applying unit substations, consider the service (environmental) conditions, system conditions installation conditions and load requirements as outlined in Section 11 of IEEE C37.121. Typical arrangements of unit substations are listed in Section 10 of IEEE C37.121.

- 1. Canadian Standards Association (CSA)
  - a. C22.1, "Canadian Electrical Code, Part I" (CEC)
- 2. International Organization for Standardization (ISO):
  - a. ISO 9001, "Quality Management Systems - Requirements"
- 3. Institute of Electrical and Electronics Engineers (IEEE)
  - a. IEEE/ANSI C37.121, "IEEE Guide for Switchgear – Unit Substations – Requirements". (ANSI approved)
- 4. National Fire Protection Agency (NFPA)
  - a. NFPA 70, "National Electrical Code (NEC)"

## 1.3 DEFINITIONS

- A. Unless specifically defined within the Contract Documents, the words or acronyms contained within this specification shall be as defined within, or by the references listed within this specification, the Contract Documents, or, if not listed by either, by common industry practice.

- 1. LV: Low Voltage
- 2. MV: Medium Voltage
- 3. USS: Unit Substation

## 1.4 SUBMITTALS

Most submittal requirements including those for electrical equipment of all types are specified elsewhere. Additional requirements should only be listed herein if they only pertain to USSs and not to electrical equipment in general.

- A. General: Submittals shall be in accordance with the requirements of Section [01 33 00][01300] Submittals and Section [26 00 10][16010] Electrical, in addition to those specified herein.
  - 1. Submit sufficient information to determine compliance with the Contract Documents. Identify submittal data with the specific equipment tags and/or service descriptions to which they pertain. Submittal data shall be clearly marked to identify the specific model numbers, options, and features of equipment and work proposed.
  - 2. Deviations from the Contract Documents shall be indicated within the submittal. Each deviation shall reference the corresponding drawing or specification number, show the Contract Document requirement text and/or illustration, and shall be accompanied by a detailed written justification for the deviation.
  - 3. Submit required product data and shop drawings specific to each product and accessory proposed. In addition, include the following information:

- a. Front view of enclosure with overall dimensions
  - b. Single line diagram
  - c. Top and bottom conduit entrance / exit locations with dimensions
  - d. Electrical characteristics of the primary equipment, transformer, and secondary equipment
  - e. Specified ratings
  - f. Bill-of-material
  - g. Shipping splits and weights
  - h. Wiring diagrams
- B. Operation & Maintenance (O&M) manuals shall be provided in accordance with the minimum requirements specified in Section [01 78 23][1780] Operation and Maintenance Data, Section [26 00 10][16010] Electrical Requirements and additional requirements specified herein.
- 1. Submit required Operations & Maintenance data specific to each product and accessory proposed. In addition, include the following information:
    - a. Operational instructions for keylock schemes, throw-over schemes, and other special instructions

## 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer shall be a firm engaged in the manufacture of unit substations and assemblies of types and sizes required, and whose products have been in satisfactory use in similar service for a minimum of ten years.
- 1. The manufacturer shall have a valid ISO 9001 certification and an applicable quality assurance system that is regularly reviewed and audited by a third-party registrar. Manufacturing, inspection, and testing procedures shall be developed and controlled under the guidelines of the quality assurance system.
  - 2. The manufacturer or their representative shall have service, repair, and technical support services available 24 hours 7 days a week basis.
- B. Installer Qualifications: Installer shall be a firm that shall have a minimum of [10] years of successful installation experience with projects utilizing equipment similar in type and scope to that required for this Project [and shall be approved by the manufacturer's representative].
- C. All work performed and all materials used shall be in accordance with the [National Electrical Code], [Canadian Electrical Code] and with applicable local regulations and ordinances. Equipment assemblies, materials, and equipment shall be listed and labeled by Underwriter's Laboratories or by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

## 1.6 DELIVERY, STORAGE AND HANDLING

- A. Prior to delivery to the Project site, ensure that suitable storage space is available to store materials in a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, humidity, and corrosive atmospheres. Materials shall be protected during delivery and storage and shall not exceed the manufacturer stated storage requirements. As a minimum, store indoors in clean, dry space with uniform temperature to prevent condensation. In addition, protect electronics from all forms of electrical and magnetic energy that could reasonably cause damage.
- B. Deliver materials to the Project site in supplier's or manufacturer's original wrappings and containers, labeled with supplier's or manufacturer's name, material or product brand name, and equipment tag number or service name as identified within the Contract Documents.
- C. Inspect and report any concealed damage or violation of delivery storage, and handling requirements to the Engineer.

## 1.7 WARRANTY

- A. General: Refer to [Section 01 77 00 - Closeout Procedures] [Section 01770 - Closeout Procedures].  
Schneider Electric extends the warranty of most equipment by 12 months at no additional cost when their service technicians perform functional testing, commissioning, and first parameter adjusting of the installed equipment.
- B. The manufacturer shall warrant products against defects in material and workmanship for [12 months from the date of commissioning or 18 months from the date of shipment – whichever comes first.][24 months from the date of commissioning or 36 months from the date of shipment, whichever comes first, provided that the manufacturer performs functional testing, commissioning and first parameter adjusting of equipment.] During the warranty period the manufacturer shall repair or replace defective products. This warranty shall be in addition to any provided by the Contractor. The warranty shall exclude normal wear and tear under normal usage and any damage caused by abuse, modification, or improper maintenance by entities other than the manufacturer or its approved representative.
- C. Additional Owner Rights: The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

## 1.8 SPECIAL TOOLS AND SPARE PARTS [- NOT USED]

- A. The Contractor shall provide a recommended spare parts list with the following information provided as a minimum:
1. Contact information for the closest parts stocking location to the Owner.
  2. Critical spare parts shall be identified as those parts being associated with long lead times and/or those being critical to the unit's operation.
  3. Maintenance spares shall be identified as being those parts required to regularly perform scheduled maintenance on the furnished equipment. These spares shall include, but shall not be limited to, consumable spares that are required to be exchanged during scheduled maintenance periods.
- B. Spare parts shall be provided for each type and size of unit installed. At a minimum, the following shall be provided:
1. Provide the minimum spare parts recommended by the manufacturer.
  2. Provide [1] set of each type of power and control fuse installed within equipment
- C. Any manufacturer specific special tool, not normally found in an electrician's toolbox, required to remove and install recommended or furnished spare parts shall be furnished. At a minimum the following shall be provided:
1. If available from manufacture[ and required to configure equipment], provide PC-based configuration software tool and a minimum of [one] communication interface cable for each type of cable required to connect a PC-based computer to the devices specified herein for configuration and programming.
  2. Electronic configuration files, in a media format acceptable by the Owner (e.g. CD, USB stick, etc.), updated to an as-installed and commissioned state.
- D. Spare parts shall be properly marked and packaged for long term storage. Printed circuit boards shall be provided in separate anti-static containers.

## PART 2 - PRODUCT

### 2.1 MANUFACTURERS

- A. [Basis-of-Design Product: Subject to compliance with requirements, provide Square D MV Unit Substation by Schneider Electric.]
- B. Acceptable Products: MV USSs specified herein shall be the product of a single manufacturer. Products and manufacturers specified are to establish a standard of quality for design, function, materials, and appearance. Products shall be modified as necessary by the manufacturer for compliance with requirements. Provide the following specified product and manufacturer without exception, unless approved as a substitute by addendum to the Contract Documents prior to the bid date:
  - 1. Square D MV Unit Substation
  - 2. [2nd manufacturer and model]
  - 3. [3rd manufacturer and model]
- C. The unit substation shall be manufactured and assembled by a single source as multiple pieces of equipment and coordinated to create a single product when it is installed at the jobsite.

### 2.2 GENERAL REQUIREMENTS

- A. MV Unit substations shall consist of a primary MV (>1000 V) incoming section, a MV substation transformer and a secondary outgoing section to distribute power. Primary unit substations shall transform MV to a lower MV for distribution and secondary unit substations shall transform MV to LV ( $\leq 1000$  V) and for distribution.
- B. The following information is typically depicted on the Drawings: bus configuration, bus ratings, [interrupting ratings.] circuit breaker ratings, main and feeder connections, application specific control wiring, elevation and footprint, etc. Where not shown on or able to be derived from the Drawings, the minimum requirements specified herein shall be provided.
- C. The following information is typically depicted in the Specifications and Drawings: [Single-ended] [Double-ended] configuration and kVA rating. The sound level of the unit substation shall not exceed the levels as per [NEMA Std. ST20 for dry-type and cast-coil transformers] [NEMA Std. TR-1 for liquid-filled transformers]. Any items not specifically mentioned but obviously necessary for proper operation are implied in this description.
- D. Primary Service Data: [34.5][24.9][13.8][13.2][12.47][7.2][4.8][4.16][2.4] kV, [50][60] Hz, available fault current [16] [20][25][31.5][40][50] kA symmetrical.
- E. System Grounding: [solidly grounded] [resistance/impedance grounded] [ungrounded]
- F. The unit substation consists of three sections: the primary incoming line section, transformer section, and the secondary distribution section. These sections are to be integrated to form a single lineup of Metal-Enclosed structures with metal barriers separating the incoming section from the transformer and the secondary from the transformer. The manufacturer is to furnish the necessary hardware, cable(s)wires and connectors to complete the unit substation's interconnections.
- G. The equipment shall be totally adjusted and tested at the factory and sectionalized for shipment.
- H. The enclosure shall be [indoor, NEMA 1, non-walk-in] [outdoor NEMA 3R, non-walk-in] [outdoor NEMA 3R, walk-in] unless indicated otherwise on the drawings. The enclosure shall be fabricated of code gauge steel and shall be painted the manufacturer's [standard paint of ANSI 49] [optional paint of ANSI 61].
- I. Where indicated on the Drawings, the unit substation(s) will be enclosed in an electric house(s). Refer to specification Section 13 34 23.11 Fabricated Electrical Houses for additional requirements.

- J. Cables entry locations, whether top or bottom, for the incoming section(s) and the secondary distribution section(s) are typically indicated on the Drawings.
- K. Incoming cable data, i.e., cable sizes and quantities per phase, shall be as indicated on the Drawings.
- L. Incoming cable termination: [provisions only] [mechanical lugs] [compression lugs] [roof bushings] [pothead termination] [busway].
- M. Provide manufacturer's standard secondary distribution equipment lug connectors to terminate cables per the specifications and plans.
- N. The manufacturer will provide [a nameplate depicting the single line diagram of the entire unit substation] [plastic mimic bus] [painted mimic bus].
- O. All nameplates (when required) are to be provided [with a white background with 3/16-inch-high black letters] [as specified]. Nameplates should be mounted with [screws] [pop-rivets].
- P. Control voltage shall be: [48] [125] [250] volts DC, [120] [230] volts AC. [AC control power shall be provided by the manufacturer internally in the switchgear via control power transformer]. [DC control power shall be provided by the manufacturer externally to the switchgear via a battery and charger system].

### 2.3 PRIMARY INCOMING SECTION

Include one of the following

- A. Medium Voltage Metal-Clad Switchgear, consisting of a drawout circuit breaker in a compartmentalized enclosure to provide protection and control of power to the substation transformer. Refer to the Drawings and to Section 26 13 26
- B. Medium Voltage Metal-Enclosed Fusible Interrupter Switchgear, consisting of a fused load-break switch to provide protection and control of power to the substation transformer. Refer the Drawings and to Section 26 13 16
- C. Medium Voltage Metal-Enclosed Compartmentalized Fusible Interrupter Switchgear, consisting of a fused load-break switch in a compact, compartmentalized enclosure, to provide protection and control of power to the substation transformer. Refer to the Drawings and to Section 26 13 29.13
- D. Medium Voltage Metal-Enclosed Compartmentalized Circuit Breaker Switchgear, consisting of a fixed-mounted circuit breaker and isolation switch in a compact, compartmentalized enclosure, to provide protection and control of power to the substation transformer. Refer to the Drawings and to Section 26 13 29.16

### 2.4 SUBSTATION TRANSFORMERS

Include one of the following

- A. Medium Voltage Dry Type VPI Transformers, to transform the primary voltage to the voltage required by the secondary outgoing section. The coils are vacuum-pressure-impregnated in high temperature polyester varnish. Refer to the Drawings and to Section 26 12 16.13
- B. Medium Voltage Dry Type Cast Coil Transformers, to transform the primary voltage to the voltage required by the secondary outgoing section. The coils are cast in epoxy to provide durability for harsh environments Refer to the Drawings and to Section 26 12 16.11
- C. Medium Voltage Liquid Filled Substation Transformers, to transform the primary voltage to the voltage required by the secondary outgoing section. The coils are immersed in a coolant and insulating liquid in a sealed tank. Refer to the Drawings and to Section 26 12 13

## **2.5 MV SECONDARY OUTGOING SECTION FOR PRIMARY UNIT SUBSTATIONS [- NOT USED]**

Include one of the following

- A. Medium Voltage Metal-Clad Switchgear, consisting of a drawout circuit breakers in a compartmentalized enclosure, for protection and isolation of secondary load feeders. Refer to the Drawings and to Section 26 13 26
- B. Medium Voltage Metal-Enclosed Fusible Interrupter Switchgear, consisting of fused load-break switches, for protection and isolation of secondary load feeders. Refer the Drawings and to Section 26 13 16.
- C. Medium Voltage Metal-Enclosed Compartmentalized Fusible Interrupter Switchgear, consisting of a fused load-break switch in a compact, compartmentalized enclosure, for protection and isolation of secondary load feeders. Refer to the Drawings and to Section 26 13 29.13
- D. Medium Voltage Metal-Enclosed Compartmentalized Circuit Breaker Switchgear, consisting of a fixed-mounted circuit breaker and isolation switch in a compact, compartmentalized enclosure, for protection and isolation of secondary load feeders. Refer to the Drawings and to Section 26 13 29.16
- E. Medium Voltage Motor Control Centers, to provide protection and control of [4160][2400] V motor loads. Refer to the Drawings and to Section 26 18 39.13

## **2.6 LV SECONDARY OUTGOING SECTION FOR SECONDARY UNIT SUBSTATIONS [- NOT USED]**

- A. Low voltage Drawout Switchgear, consisting of a drawout low voltage power circuit breakers in a compartmentalized enclosure, for protection and isolation of secondary load feeders. Refer to the Drawings and to Section 26 23 00
- B. Low Voltage Switchboard, consisting of molded case circuit breakers or insulated case circuit breakers in a free-standing dead front enclosure, for protection and isolation of secondary load feeders. Refer to the Drawings and to Section 26 24 13.11
- C. Low Voltage Motor Control Centers, to provide protection and control of LV motor loads. Refer of the drawings and to Section 26 24 19

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- A. In addition to the requirements specified herein, execution shall be in accordance with the requirements of specifications Section [26 00 10][16010], Section [26 08 00][16080] and Drawings.
- B. Examine equipment exterior and interior prior to installation. Report any damage and do not install any equipment that is structurally, moisture, or mildew damaged.
- C. Verification of Conditions: Examine areas and conditions under which the work is to be installed, and notify the Contractor in writing, with a copy to the Owner and the Engineer, of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.
- D. Pre-Installation Conference: Prior to commencing the installation, an onsite pre-installation conference shall review the material selections, installation procedures, and coordination with other trades. Attendees shall include, but shall not be limited to, the Contractor, the Installer, manufacturer's representatives, and any trade that requires coordination with the work. Date and time of the pre-installation conference shall be acceptable to the Owner and the Engineer
- E. Beginning of the work shall indicate acceptance of the areas and conditions as satisfactory by the Installer.

- F. Install equipment in accordance with reviewed product data, final shop drawings, manufacturer's written instructions and recommendations, and as indicated on the Drawings.
- G. Provide final protection and maintain conditions in a manner acceptable to the manufacturer that shall help ensure that the equipment is without damage at time of Substantial Completion.

### 3.2 FACTORY ACCEPTANCE TESTING [- NOT USED]

### 3.3 FIELD QUALITY CONTROL [- NOT USED]

Schneider Electric extends the warranty of most equipment by 12 months at no additional cost when their service technicians perform functional testing, commissioning and first parameter adjusting of the installed equipment.

- A. Functional testing, commissioning, and first parameter adjusting shall be carried out by a factory-trained manufacturer's field service representative. This manufacturer's field service technician shall provide all material, equipment, labor and technical supervision to perform inspection, testing and adjustments to ensure equipment is installed, adjusted, and tested in accordance with the manufacturer's recommendations and is ready for operation. The manufacturer's field service technician shall replace damaged or malfunctioning equipment and report to the Engineer any discrepancies or issues with the installation.
- B. The manufacturer's representative shall, upon satisfactory completion of inspection and testing, attach a label to all serviced devices indicating the date serviced and testing company responsible.

### 3.4 INSTALLATION

- A. Adjust the primary taps of the transformer so the secondary voltage is within 1/2% of the rated voltage.

### 3.5 FIELD TESTING AND COMMISSIONING [- NOT USED]

#### A. Operational Readiness Testing

1. The Contractor shall inspect and test furnished equipment and associated systems for conformance to the contract documents, including equipment manufacturer's recommendations, and readiness for operation. The test shall include the following as a minimum:
  - a. Visually inspect for physical damage and proper installation
  - b. Perform tests in accordance with manufacturer's instructions
  - c. Perform tests to ensure compliance with Contract Documents
  - d. Perform tests that equipment is ready for operation
  - e. Touch-up paint all chips and scratches with manufacturer-supplied paint and transfer remaining paint to Owner
2. Contractor shall submit an operational readiness test report documenting all test results, including all assumptions, conditions, allowances and corrections made during the test. **The report shall provide a listing of all modifications and adjustments made onsite to include any settings / parameters not identified as factory defaults within the equipment's O&M documentation.** The test report shall include a signed statement from the Contractor, installer(s) and the factory-trained manufacturer's representative(s) certifying that the furnished equipment and associated system have been installed, configured, and tested in accordance with the manufacturer's recommendations, completely conforms to the requirements of the Contract Documents and is ready for operation.

#### B. Functional Demonstration Testing

1. **Prior to scheduling functional demonstration testing the Contractor shall submit a signed statement from the Contractor, installer(s) and the factory-trained manufacturer's representative(s) certifying that the furnished equipment and associated system have been installed, configured, and tested in**

accordance with the manufacturer's recommendations, completely conforms to the requirements of the Contract Documents and is ready for operation.

2. The Contractor shall completely demonstrate the functionality and performance of the equipment and associated systems in the presence of Owner and Engineer, observing and documenting complete compliance with the Contract Documents.
3. The Contractor shall submit a written report documenting successful completion of functional demonstrating testing including all assumptions, conditions, allowances and corrections made during the test.

### 3.6 TRAINING [- NOT USED]

- A. O&M Training: Onsite training specific to the equipment furnished shall be provided to the Owner's staff by a factory trained manufacturer's representative. Training duration shall be sufficiently adequate to cover the operation and maintenance of the equipment and shall consist of not less than [1][2 repeated] session(s) with [2] hours of onsite classroom and hands-on instruction for a minimum of [4] attendees per session.
  1. The instructor shall provide sufficient time and detail in each session to cover the following as a minimum:
    - a. Theory of operation
    - b. Major components of equipment
    - c. Operation of equipment
    - d. Configurations of equipment
    - e. Maintenance, troubleshooting and repair
    - f. Replacement of component level parts
  2. [The submitted O&M manuals shall be used for training.][Manuals and documentation shall be provided to each participant for training.]

### END OF SECTION [26 11 13] [16360]

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